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A THERIDIID SPIDER NEW TO BRITAIN ESTABLISHED AT KEW

By JOY O. I. SPOCZYNSKA, F.R.E.S., F.Z.S.

During a visit to Kew Gardens, 14.xi.66, I discovered the pan-tropical spider *Coleosoma floridanum* Banks (Araneae, Theridiidae) established in one of the larger hothouses. Twenty specimens, three males and 17 females, were found.

Genus *Coleosoma* O.P.-C.

Coleosoma O.P.-C., 1882, *Proc. zool. Soc. Lond.*, p. 426

Small theridiid spiders, less than 3 mm in total length. Eyes very small; eyes of posterior row 1 to 2 diameters apart. Clypeus projecting. Chelicerae devoid of teeth on anterior margin, or with one tooth only. First pair of legs longest; fourth pair of legs next longest in females, second pair of legs next longest in males. Tarsal comb present. Abdomen sometimes modified in female, always in male. Colulus absent.

Epigyne of female weakly sclerotised, very variable. Male palp with functional median apophysis, sclerotised radix, weakly-sclerotised conductor and filiform embolus (see Fig. 1 (d)).

The males of *Coleosoma* have a sclerotised bilobate anterior dorsal scutum, continuing ventrally. In a few species some constriction of the abdomen occurs. These characters separate males of *Coleosoma* from *Theridion*. *Coleosoma* is now thought to be less closely related to *Steatoda* than formerly considered (H. W. Levi, 1959), but the few known *Coleosoma* species are very closely related to one another.

Coleosoma floridanum Banks, 1900, *Can. Ent.*, 32:98

This species is pan-tropical and, owing to its inconspicuous size and to its habit of clinging to vegetation, it is probably fairly easily imported into other countries on plants carried aboard ship. It appears to be indigenous to the U.S.A., but has also been reported from the Bahamas, Costa Rica, El Salvador, Cuba, Jamaica, Haiti, Dominican Republic, Puerto Rico, Martinique, Trinidad, Venezuela, Colombia, Peru, Galapagos Islands, Togo and New Hebrides. It has also been found in Hawaii 'on plants said to have been imported from Calcutta'.

It is interesting to compare the countries listed in the above records with the origins of the plants in Kew Gardens on which the specimens of *Coleosoma floridanum* were found (see Table I). Their occurrence on these plants is not, of course, proof that the spider was imported into Britain on all of them; it may well have been brought in on one plant only, so it is not possible to know the precise country of origin.

Female. Total length 2.2 mm. Length of patella and tibia of first pair of legs 1.1 mm; length of patella and tibia of fourth pair of legs 1.1 mm.

Cephalothorax and legs yellowish. Abdomen greyish with two longitudinal dorsal black stripes. These are typically entire, but variations commonly occur in which they may be broken up medially to form four separated half-stripes. Some spots of white pigment, irregularly distributed and very variable in extent, are usually present; in appearance these are very reminiscent of the irregular

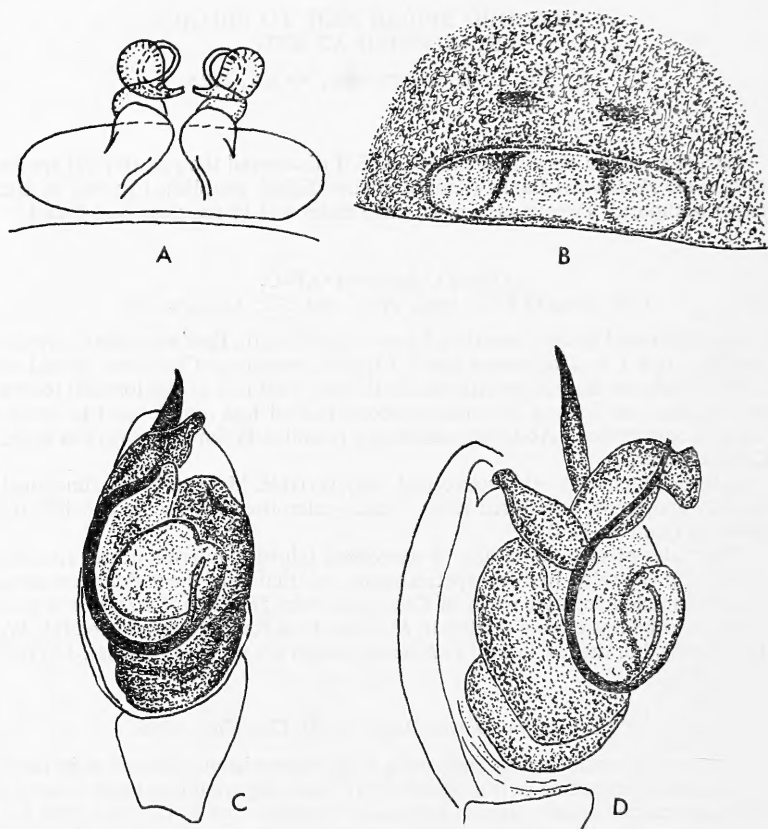


Fig. 1

Coleosoma floridanum Banks. (a) Female genitalia, dorsal view. (b) Epigyne. (c) Male palp. (d) Male palp, expanded. (Drawn by Melchior Spoczynski (after Levi).)

white pigmented spots found in *Floronia bucculenta* (Clerck) (Araneae, Linyphiidae).

In *Coleosoma floridanum* the epigyne (Fig. 1 (b)) is transparent, very lightly sclerotised and indistinct; the epigyne and the internal genitalia (Fig. 1 (a)) are entirely different in appearance from these structures in the other two closely-related *Coleosoma* species, *C. normale* Bryant and *C. acutiventer* (Keyserling).

Male. Total length 1.8 mm. Length of patella and tibia of first pair of legs 1.1 mm; length of patella and tibia of fourth pair of legs 0.9 mm.

Cephalothorax and abdomen both darker than these parts in the female; abdomen elongated with constricted ventral scutum on anterior half, which also bears dorsal stridulating excrescences. The male is an ant-mimic and frequently runs on the surface of the ground. Two of the male specimens found at Kew were actively running on the plants concerned.

The male palp is shown at Fig. 1 (c) and (d).

Several of the female specimens were found in or near tiny webs, not more than about 8 mm in diameter, spun in the axils of leaves, but the majority of the specimens were found on the undersides of the leaves of the plants, without webs.

An unidentified egg-sac, possibly of this species, was located on a plant, *Holarrhena febrifuga* (Apocynaceae), from East Africa. There was no sign of the female, or any other spider, on this plant. The egg-sac was very small, not more than about 4 mm in length, creamy-white in colour, and oval in shape; it had the appearance of having been woven from long, shining silky fibres close together running lengthways. It had been spun in the axil of a leaf.

Regarding the food of *Coleosoma floridanum* in Kew, a careful search of the hothouse produced a number of small chironomid-type flies, one small bug, several aphids, a few thysanuroids, and a very small species of ant. Some of these invertebrates may possibly form the food of the spiders.

Coleosoma floridanum appears to be well-established, and a flourishing colony.

TABLE

Temperature in hothouse 75°F. Extreme humidity—steam rising from floor gratings and condensation on all glass surfaces. Time of collecting operations: 14.30 to 16.00 hours G.M.T.

Tube No.	Sex	Name of Plant	Country of Origin	Remarks
1	♂ (imm.)	<i>Euadenia eminens</i> (Capparidiaceae)	Tropical Africa	Typical form
2	♀	<i>Aristolochia tricaudata</i> (Aristolochiaceae)	Mexico	Ditto
3	♀	<i>Clibadium platylepias</i> (Compositae)	Not known	Lateral dark stripes widely separated
4	♀	Ditto	Ditto	Ditto
5	♀	<i>Plumbago zeylanica</i> (Plumbaginaceae)	Indonesia	Typical form
6	♂ (imm.)	<i>Dombeya</i> × <i>cayeuxii</i> hybrid (Sterculiaceae)	Not known	Typical form
7	♀	Ditto	Ditto	Ditto
8	♀	Ditto	Ditto	White spots very faint; lateral dark stripes entire

9	♀	<i>Myriocarpa stipitata</i> (Urticaceae)	Tropical America	White spots very faint
10	♀	Ditto	Ditto	White spots faint; very faint broken lateral dark stripes
11	♀	Ditto	Ditto	Broken lateral stripes widely spaced
12	♀	<i>Psychotria tarambasica</i> (Rubiaceae)	East Africa	White spots well-marked; lateral broken stripes
13	♀	Ditto	Ditto	White spots well-marked; very dark lateral broken stripes with larger blotches
14	♀	<i>Miconia saldanhaei</i> (Melastomaceae)	Brazil	Typical form
15	♂	Ditto	Ditto	Ditto
16	♀	<i>Aphelandra deppeana</i> (Acanthaceae)	Central America	Lateral broken stripes with obscure blotches
17	♀	<i>Almeidea rubra</i> (Rutaceae)	Brazil	Heavily blotched; broken lateral stripes not widely separated
18	♀	<i>Ficus neumanni</i> (Urticaceae)	Not known	Typical form
19	♀	<i>Lepidozamia peroffskyana</i> (Cycadaceae)	Australia	Ditto
20	♀	Ditto	Ditto	Ditto

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NOTES ON BREEDING *TRISATELES EMORTUALIS* SCHIFF.
AND THE DISCOVERY OF LARVAE AND PUPAE
IN THE WILD

By B. R. BAKER, B.SC., F.M.A., F.R.E.S.
Museum & Art Gallery, Reading

The rediscovery in Britain of adults of this interesting species occurred in July 1962 after an interval of 103 years, and was due to the fieldwork of Messrs. Fairclough, Harman, Homer and Tweedie. From that time until 1966 adults appear to have been taken annually at mercury vapour light in a limited area of the Chilterns—the records however refer almost entirely to single specimens.

The writer's first experience of this species was in 1967 when *Trisateles emortualis* Schiff. appeared in unprecedented numbers. Working with Mr. T. J. Homer we recorded 21 examples on the night of 11/12th July, Skinner and Chatelain recorded 26 on the night of 13/14th. The weather had for several days been extremely fine with high night temperatures contributing to optimum conditions for the activity of night-flying Lepidoptera. It would almost appear that a sudden emergence had taken place about the time of our visit for Skinner, working the same ground on 10/11th July, under conditions when 95 species of Lepidoptera were seen, did not see *T. emortualis*.

The opportunity was taken to attempt breeding this species and, as sexing the adults in the field was not easy, a number were boxed and examined back in Reading. Examining the form of the frenulum with a $\times 10$ lens revealed that five males and two females were present, and these were all placed in a large plastic box 11" \times 6" \times 4" which was lined throughout with newspaper. A layering of dead oak and beech leaves was added, also twigs bearing fresh leaves of each. The leaves were sprayed with rain water and feeding pads of cellulose wadding dipped in dilute sugar water were placed on glass discs in the box. After three days four of the males and one of the females died. On this date the remaining male and female were observed feeding at the pads from 12.45 to 01.15 a.m. without moving away.

At the end of the 6th day (17th July) the first egg was observed deposited upon the newspaper lining of the box. It was whitish green when first observed and by the following day had developed irregular red fleckings. A further two eggs were discovered on 18th July, one being unicolorous pale green and the other having reddish flecks. Both the male and female moths died on 20th July having lived for nine days. A careful examination of the box the following day revealed nothing on the dead leaves or on the twigs with fresh leaves, but a fourth egg was found deposited on the paper lining as had been the case with the previous three.

The four eggs were transferred to a glass-topped tin and supplied with both dead and fresh oak and beech leaves.

The egg is dome-shaped with a flattened basal disc and has prominent ribs running from apex to base. Subsidiaries join the apical ribs so that at the edge of the basal disc some 32 ribs are evident—these are easily visible with a $\times 10$ lens. The diameter of the basal disc is 0.56 mm.

Only one of the eggs hatched, the following observations therefore relate to a single larva.

22nd July A large hole noted in the crown of the egg and examination revealed the presence of a minute, transparentish larva. This was transferred to a separate 3" \times 1" glass-topped tin and supplied with dead and fresh oak and beech leaves.

- 5th August Apart from damping the filter paper in the bottom of the tin the leaves had been undisturbed until this date. It was now found that the dead oak and beech leaves were uneaten as was the fresh beech. The fresh oak leaves placed in the tin on 22nd July had now browned and one of these was being systematically skeletonised by the larva which was now 11 mm in length. The larva fed on this single leaf until only the mid-rib was left.
- 13th August Two ecdyses were indicated by the presence of head capsules in the tin. By this time the larva had an overall golden appearance with dark brown mottlings, the head was mottled with dark brown reticulations.
- 15th August A further ecdysis took place and the larva now assumed a distinct velvety appearance due to the presence of a fine, close pubescence.
- 20th August A second browned oak leaf had now been reduced to a bare mid-rib.
- 24th August The larva was photographed. It noticeably shunned the light, and though sluggish in movement crawled away to the under surfaces of the leaves. It was distinctly looper-like in motion having well developed prolegs on abdominal segments five and six, but only a vestigial pair on segment four.

Subsequent development was very slow though the larva was observed to feed both by day and night. The length of larval life was 71 days, the whitish cocoon being spun within a curled oak leaf at the beginning of October.

WILD LARVAE AND PUPAE

Several authors mention the larva of *T. emortualis* and its habits. Treitschke, quoting Herr von Tischer, says, 'I found it on the 5th September on oak. Its movements were very sluggish. It feeds only on dry oak leaves—it will not touch green ones. This almost leads one to believe that its real food are lichens to be found on oak. It pupates at the beginning of October in a whitish web which it has spun to the side of a leaf.'

Hofmann says, 'It feeds on fallen, dry oak leaves which it transforms into a sieve appearance. In the absence of oak as in areas of Bukowina it feeds on beech leaves . . . it changes itself in autumn in a light cocoon to a yellowish brown pupa with two curved end tips.'

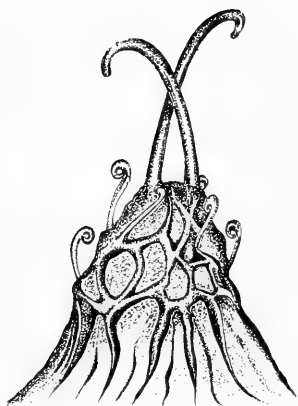
Hoffmeyer also makes the point that the larva lives particularly on oak, rarely on beech, and prefers the withered leaves. Seitz gives the foodplant as fallen oak and beech leaves.

In October 1963, the year after the rediscovery of the adult, a search for larvae among dead beech leaves had proved unsuccessful, but as 1967 had proved an exceptional year for *T. emortualis* it seemed a propitious year to attempt a further search especially as one had the advantage of having seen the form of the solitary larva *ab. ovum*.

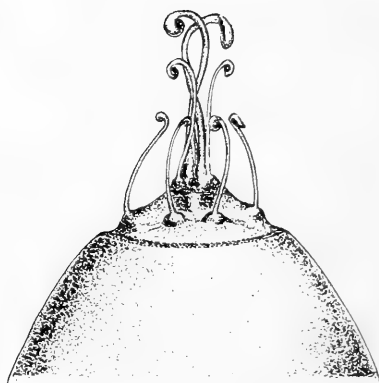
One method was to place large polythene sheets on the beechwood floor, cover these with dead leaves and leave them undisturbed for several weeks. At the end of August the sheets were lifted and the leaf covering shaken and examined but no larvae were found. The 'hands and knees' method also proved abortive but on one occasion during the autumn some dry oak leaves still adhering to their twigs were discovered and these bore the very characteristic skeleton pattern evidenced by the captive larva. Within these leaves were several larvae possessing the tubercular marks of 'snouts' but differing so markedly in colour from the captive example that it seemed unlikely they could be *T. emortualis*. Later examination



Characteristic skeletonising of beech leaves by larvae of *Trisateles emortualis* Schiff.



T. emortualis Schiff.
Cremaster dorsally



Z. nemoralis Fab.
Cremaster dorsally

Although the pupae of *Trisateles emortualis* Schiff. and *Zanclognatha nemoralis* F. bear a superficial resemblance to each other macroscopically, the cremaster of each species when viewed under the microscope provides a ready guide to identification.

	<i>T. emortualis</i> Schiff.	<i>Z. nemoralis</i> F.
<i>Av. pupal length</i>	6 mm incl. cremaster.	6 mm incl. cremaster.
<i>Pupal colour and characteristics</i>	Shining reddish brown. Abdominal segments bearing fine silky hairs. Slight pitting of dorsal segments.	Shining reddish brown. Abdominal segments bearing hairs half the length of those present in <i>emortualis</i> . Marked pitting of dorsal segments.
<i>Cremaster</i>	Much blackened and ridged. Two prominent apical hooks with a basal series of six small hooks at various levels (see fig.).	More compact and finer than <i>emortualis</i> . Apical hooks not widely diverging, basal hooks regularly arranged with one pair longer than the rest (see fig.).
<i>Form of cocoon</i>	Spun within dead leaves. Of fine white silk with prominent strutting at leaf edges.	Spun within dead leaves. Of a more open-work net than <i>emortualis</i> . Struts at leaf edges not prominent.

with a hand lens however revealed their tubercular patterning to be identical with the known larva. Colour transparencies were sent to Dr. Hoffmeyer who kindly pronounced them to be *T. emortualis*, adding that in his experience the species was not difficult to bring through.

Systematic working throughout the autumn resulted in the discovery of larvae in several areas away from the main centre. These came from both oak and beech leaves which were withered but not blackened and which were still attached to twigs. From the results of many excursions it was evident that *T. emortualis* exists over a wide area, also that the larvae exhibit considerable colour variation. Of interest was the finding of a larva by Mr. T. J. Homer which was of a colour form exactly matching that of the captive larva. It was also on a joint excursion that Mr. Homer took the first larvae to be found on beech.

In the autumn of 1968 some larvae were sent to Mr. G. Haggett who had kindly consented to prepare a colour illustration, and thereby give us an excellent indication of the colour variability that exists.

On several occasions larvae of *Zanclognatha nemoralis* F. were found. This species also has the habit of skeletonising dead oak and beech leaves, though perhaps not so precisely as does *T. emortualis*.

On two occasions in October 1967 attempts were made to discover pupae in the wild. This proved a tedious undertaking as one had to pick up systematically fallen leaves from a given area and judge by the feel of the leaves whether a cocoon could be within. Three pupal packets were found within old blackened beech leaves at a level just below the superficial covering of newly fallen leaves. That is, they were between the recent unimpacted leaf litter and the impacted lower bedding. It would seem likely that this pupation site is sought out by the larvae in preference to a pupation site at higher levels of the woodland floor where wind action would quickly disperse the topmost leaves. Should pupation take place within curled leaves at the higher levels where the larvae occur, these leaves would also in turn fall and be susceptible to wind action. A test showed that

dead beech leaves would remain still attached to twigs for up to a period of six months, being finally dispersed by March winds.

Both *Z. nemoralis* and *T. emortualis* emerged from these wild pupae the following summer and a table is therefore given indicating some of the points of similarity and dissimilarity that has been found to exist in the pupae and forms of cocoon of the two species.

EMERGENCES

The cocoons were kept all winter in a cool cellar having a maximum temperature of 58°F. and a minimum of 48°F. In late May some of the pupae were brought to an upstairs room with a temperature of 70°F. and the first emergence of *T. emortualis* took place on 27th May. Under these conditions pupae continued to emerge until mid June. Other pupae were left in the cellar to complete their development and adults from these hatched from mid June until 2nd July.

CONCLUSIONS

Elton in his chapter on The Ground Plan of Woodland discusses the rate of disappearance of fallen leaves from the woodland floor. Oak leaves are reacted upon by various agencies and most of the leaves disappear after a year whereas beech accumulates for at least two years. It is suggested that the failure to obtain many eggs of *T. emortualis* could have been due to the fact that the dead leaves provided were too old. From experiences in finding wild larvae it would appear that withered bunches of leaves of the current year are the preferred egg-laying sites. By placing older leaves on to polythene sheeting one is presumably providing an unnatural, and in our experiences, an unproductive, site for the moths to oviposit upon. The preferred egg-laying sites and consequently the habitats for these somewhat sluggish larvae have been found to be in direct contrast to the pupation sites for the small number of pupae which were discovered.

At the time of writing *emortualis* has only been discovered in Bucks, though in several well separated areas. Much searching in Oxfordshire in 1968 has not yet resulted in finding the species in that county.

South mentions a record of this species from Epping Forest, Essex, and as the record is said to be well authenticated it seemed worthwhile to search there this autumn. The day chosen was, unfortunately, that on which the very heavy rains commenced which later caused the serious outbreak of flooding in the south east, and therefore scarcely constitutes a fair trial. However, from the known fact of the moth's reluctance to come to light except under very favourable weather conditions and in the light of our experiences in the Chilterns where the species had continued to exist undetected for 103 years, it is suggested that it is within the bounds of possibility that *T. emortualis* still exists in Epping Forest.

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NOTES ON FLEAS

With the first record of a
mermithid Nematode from the Order

By MIRIAM ROTHSCILD

(Extracts from a paper delivered in May 1967: received 26th September 1968)

During the last six years I have been investigating the effect of the mammalian hormones on the breeding-cycle of fleas, and this study has necessitated the examination of several thousand serial sections of both the pupal and the imaginal stages. These sections frequently present new and tempting problems which one must firmly set aside in order to pursue the central theme. Firstly I am going to discuss very briefly three parasites of the rabbit flea which have turned up in this manner during the last few months, each presenting a new and quite interesting line of research which perhaps others may feel inclined to pursue.

MATING BEHAVIOUR

The rabbit flea (*Spilopsyllus cuniculi* Dale) in nature, copulates only on the newborn rabbit. Both male and female fleas undergo a period of maturation on the pregnant doe under the influence of the rising level of hormones in the blood of the host. Both sexes become noticeably larger and also feed faster—at any rate they defaecate far more rapidly—and their internal organs undergo certain obvious changes. The salivary glands enlarge, the gut elongates, and the cells forming its epithelial lining proliferate. In the female the ovaries develop, and in the male the accessory sex-glands also increase enormously in size. A female rabbit flea feeding on an oestrus doe rabbit cuts into 50–60 serial sections 8μ in thickness, and a male flea into 30–40. On the fully pregnant doe the female cuts into 80–110 sections, and the male into 50–60. This quite noticeable increase in size occurs in the space of ten days—the inter-segmental membranes expanding to accommodate the enlarged internal organs. During this period the fleas remain attached to the rabbit's ears in close proximity to one another—not infrequently in such dense aggregations that the individual specimens are actually touching. But the sexes appear oblivious of each other's presence. In certain individual hosts when the hormone level is high—and this is a very variable factor—the females begin to lay sterile eggs yet the males make no attempt to pair with them. When the young are born the fleas detach themselves from the ears and transfer to the nestlings, where they feed avidly all over the body—more especially in the sacral region—and soon pair. Sometimes copulation takes place within a few moments of the transfer—sometimes it may not occur for a few hours, but within 24 hours all the female fleas are fertilised and egg-laying is in full spate. In nature it may happen that unfed fleas have hatched in a burrow from eggs and larvae originating from an infestation of a previous litter of young rabbits. Those fleas which have not matured on a pregnant doe obtain their first feed on these newborn nestlings, but such fleas will not pair on them for at least five days. It appears that the newly-hatched flea has a latent period during which time it does not respond to mammalian hormones, but this period is shorter on newborn young than on an oestrus doe.

We (Bob Ford and myself) have tried to vary this situation experimentally. First of all we have released female fleas matured on pregnant doe rabbits on to nestlings, together with male fleas which have lived previously only on buck

rabbits. In such cases pairing takes place just as if both sexes had moved on to the newly-born young from the pregnant doe. On the other hand, if the male fleas have been reared on the prepartum doe and the females on the buck rabbit, at least ten hours will elapse before pairing occurs on the nestlings.

We also introduced females which had matured on prepartum does, together with freshly-hatched, unfed males, on to newborn young, and found that pairing occurred initially after an interval of approximately twenty hours.

These experiments demonstrated several quite interesting facts:

1. Both sexes of the rabbit flea require a blood meal before they will pair, but in the case of the male flea the blood of the buck rabbit or oestrus doe can be sufficient to provide the necessary stimulus.
2. The female rabbit flea will not give the mating signal to the male until she has undergone a period of maturation either:
 - a. on the prepartum doe plus newborn young: or
 - b. on the newborn young only.
3. A longer period of maturation is required before pairing occurs if, instead of fed, unfed fleas are introduced on to newborn baby rabbits.
4. The male flea is prepared to mate sooner than the female flea, but must apparently await some signal from her before he attempts to do so.

We have carried out several experiments (Rothschild & Ford, 1966) which have indicated that one of the factors required to stimulate the female to emit this signal is a high level of growth hormone (secreted by the anterior lobe of the pituitary gland) in the young rabbits. Copulation is not necessarily connected with maturation of the female gonads or with the ability of the male to effect impregnation.

PARASITIC WORMS

We had just published these suggestions when one day, much to our dismay, we observed a pair of rabbit fleas copulating on the ears of a pregnant doe rabbit. We at first assumed that, somehow, we had missed this type of behaviour in the past, and that, on the quiet, some fleas were pairing on the pregnant doe—or perhaps only on those with an unusually high level of growth hormone in their placenta. But on less panicky second thoughts this seemed most improbable, so we fixed the two fleas and sectioned them. This in fact proved the right approach, for we found the female flea was infested with a large larval mermithid worm. As you can see on Plate I, Figure 1, the body was filled with coil upon coil of the parasite. Although the reproductive organs of the flea show signs of maturation, they also display various abnormalities. Since it has previously been recorded that mermithids modify the behaviour of their hosts (Wheeler, 1928; Welch, 1963), it is not totally unexpected that the female flea, greatly disturbed by the presence of this relatively enormous worm, should have signalled her agreement to premature mating! Nevertheless, it raises an interesting question. What is this signal? In the normal course of events the males on pregnant rabbits' ears are attached in close proximity to the females—which are sometimes gravid females laying sterile eggs—yet do not recognise them as such, but we know from our experiments on the newborn young rabbits that these males are themselves willing to pair at this stage. The most reasonable suggestion is, probably, that the female flea, like the female moth, releases a pheromone which gives the male the green light for pairing. However, I have as yet found no specialised gland which could

be the organ releasing such a pheromone. Nor could I find any change in the internal organs of the infected flea which linked it to those females feeding on newborn young which were willing to pair. The relationship between the parasite and the copulating signal of the female rabbit flea is an intriguing one, but I fear it will prove very difficult to investigate as this mermithid seems such a rare parasite. It has turned up only once in over four thousand fleas examined in serial section, and rabbit fleas have only on this single occasion been observed pairing on the prepartum doe.

This is the first time a mermithid has been found in a flea, although it has been recorded from 15 other Orders of insects. It is sometimes very difficult to determine these larval forms. Dr. George Poinar, who kindly examined this slide, assured me that the structure of the pointed tail and the cuticle leaves no room for doubt at all that this is a mermithid, and Dr. W. Grant Inglis agrees with his view. Curiously enough, within a few weeks of this discovery two further specimens were sent to me by Professor A. G. Chabaud which can probably be assigned to the same group:

1. From a female *Myoxopsylla laverani* Roths. collected from the nest of *Eliomys quercinus* by Dr. Emile Roman at Gallia St. Didier au Mont d'Or, Rhône (France);
2. From a female *Ctenophthalmus arvernus* Jordan collected by Dr. Jean Claud Beaucornu.

These worms, however, were dissected out of specimens preserved in 70 per cent alcohol and mounted in canada balsam, and it was not possible to determine them with certainty although Professor Chabaud agreed with me that they were in all probability also larval mermithids. It should be noted that all three infected fleas were females.

ECTOPARASITES

It is, of course, well known that larval mites insinuate themselves beneath the sclerites of fleas which they use as a means of transport and dispersal. Mitzmain (1910) & Cooreman (1944) studied the habits of one of these tyroglyphid mites, which as adults are debris-feeders in nests but which in the non-feeding hypopus stage use fleas as transport-hosts. Mitzmain introduced a rat flea bearing such hypopus larvae into one of his cultures, and soon had it swarming with mites. The flea larvae were more heavily infested than the adults; one specimen examined bore 26 mites on its body. The average number on 200 adult fleas was three, and such infested specimens seemed in no way incommoded and lived as long as uninfested controls. Occasionally a single flea became so heavily over-infested that it apparently died from a surfeit of mites—which covered the entire surface of the body and obstructed the tracheal system. Mitzmain found such a specimen among naturally-infested squirrel fleas, which also averaged three hypopus larvae each, apart from this particular individual which harboured 98. It was helpless, unable to jump, and lay on its side struggling feebly at intervals, until it died 36 hours later. I have found a hedgehog flea in a similar distressing condition. Mitzmain noted that at the time of the flea's death the mites were almost synchronously roused to action: 'In bestirring themselves from their inactive condition one would imagine that a state of demoralisation had seized them, for they were seen to pry free the sucking discs, loose their perch, and move away from the dead host.'

When I originally delivered this paper last year, you may recall that I suggested

that possibly these mites were not mere hitchhikers, using the fleas as a form of convenient transport, but that they also performed some useful function for the fleas. Quite recently a brilliant piece of work by B. P. Springett (1968) has shown that certain mites carried about by burying beetles (*Necrophorus*) destroy the eggs of Diptera laid on the corpses of animals, which, if allowed to hatch, would quickly consume the potential food supply of the larval burying beetles. In fact without the mites it appears that these beetles have difficulty in rearing a brood, since blowflies seem invariably to beat them to the most suitable corpses. It is interesting that I have also occasionally found these beetles with an enormous overload of mites, 460 on one occasion, and Springett records as many as 800 on old and moribund females. Although it has never to my knowledge been suggested, I have always fancied that the band of hairs on the underside of the burying beetle's abdomen was some special adaptation to protect or attract mites. I cannot say that I have found even a hint of such a structure in fleas, yet I still feel that a closer investigation of the relationship between hypopus mites and their transport-hosts would prove rewarding. It was with this in mind that I began to look a little more carefully at the various species I found tucked away so neatly beneath the abdominal sclerites of their hosts, and in the process came across what may well be a true ectoparasite of fleas.* This is *Cheyletiella parasitivorax* Mégnin, which has been recorded three times as a 'phoretic' mite attached to fleas:

1. from a flea on a cottontail rabbit, Savannah, Georgia, C. N. Smith, 1942;
2. from *Odontopsyllus multispinosus*, Mount Carmel, Connecticut, G. H. Plumb, 1944;
3. attached near the metepimeron of a cat flea from *Lepus aegyptius*, Palestine (British Museum collection).

The specimen I discovered was a mature female (kindly determined by G. O. Evans) with one large egg in the oviduct, attached by her chelicerae to the inter-segmental membrane of the rabbit flea (*S. cuniculi*). The habits of this mite are not known with certainty. It is found in the fur of rabbits and occasionally on cats, and is said to be a predator of small, soft-bodied mites such as *Listrophorus*, *Myobia*, *Notoedrus*, *Psorergates*, etc. parasitising the mammalian host (Cooper, 1946). Others have thought that it is associated with lesions of the host itself. Cooper suggests that *Cheyletiella parasitivorax* is an example of Ewing's (1912) semi-parasitic stage in the evolution of a truly parasitic mite. The female specimen which I found had its mouthparts deeply embedded in the tissues of the flea, in a manner which did not suggest a casual or accidental fixation but a highly specialised mode of attachment. In fact the lesion in the flea's integument indicated that it had been attached to that particular spot for some considerable time. It is possible that many records of mites are classified as 'phoretic' merely because it is widely known and believed that mites beneath the sclerites of fleas are of this type. A more careful examination might well reveal that a number of them, like my specimen, were actually feeding on the tissues of the host. In any case this also seems a relationship that merits closer attention.

FLAGELLATE PARASITES

It is always rather interesting if parasites reveal new facts about their host. Thus, for example, the behaviour of the rabbit fleas indicated that the level of

*Cooreman (1944) records *Pyemotes* sp., a genus parasitic on insects, from a specimen of *Ctenophthalmus bisocodentatus* Kol.

certain hormones in the blood of the rabbits falls in winter and rises again in the spring, suggesting that there exists an annual cycle, as well as a daily cycle, in corticosterone blood levels. I came across some flagellate parasites in fleas which certainly revealed a few points which were new to me about their hosts. Unlike the mermithids, this group is exceedingly common in fleas—far commoner than infestations of hypopus mites. Sometimes up to 50 per cent of a flea population on an individual rabbit is affected. First of all, part of the life-cycle of the Rabbit Trypanosome (*Trypanosoma nabiasi* Railliet) is passed in the rabbit fleas, for which it serves as the intermediate host. Secondly, it harbours an exceedingly common *Leptomonas*. Leptomonids have been recorded from a large variety of fleas, the cat and dog fleas and their larvae, vole fleas, mole fleas, mouse fleas, squirrel fleas, bird fleas, and the human flea—a list that I could enlarge considerably from personal records. The early records are to be found in Wenyon's *Protozoology*, together with an account of their life-history, which is simple and direct, all stages occurring in the flea or its larval and pupal stages, and no vertebrate host—as in the case of the Trypanosome—is involved. Some authors believe that each species of flea has its own specific *Leptomonas*, whereas others favour the notion that all are one and the same species capable of infesting a large variety of hosts. From the literature we learn that this flagellate is primarily a parasite of the hind gut, rectum and malpighian tubules, and the infestation is said to stop somewhat abruptly at the pyloric opening and only occasionally, in the case of very massive infestations, extend into the midgut. However, in the rabbit flea the infection is quite often present in the midgut, and moreover there is a favoured site of attachment in this region at the base of the proventriculus. This suggested that there might be something peculiar about the site in question, and a closer examination revealed the fact that the cells were unlike those of the surrounding midgut epithelium, and possessed quite distinctive staining properties suggesting a secretory function. Subsequently I found these specialised cells seemed to reach maximum development in the truly sessile fleas such as *Tunga*.

Another favourite site for these parasites is the rectal glands, of which the flea usually has six, protruding into the cavity of the rectal ampulla; they aggregate so densely on the surface of the rectal glands—which are feebly sclerotised—that these organs appear to be covered in a sort of fur sock. In serial sections it is noticeable that sometimes there may be a definite space between the gland itself and the flagellates, which then appear to surround it like a dense halo (Plate I, Fig. 2). It seemed possible that this was an artifact engendered during fixing or staining, and in fact it may have been so, but these halos were also reminiscent of an illustration in a paper by Thorpe (1930) in which he had used flagellates to demonstrate the oxygen uptake of caudal gill filaments. Thorpe's flagellates were attracted to any region where oxygen was being abstracted from the medium, but when the oxygen uptake of the gills fell the flagellates moved away towards the edge of the slide, producing basically the same halo-like effect that one could observe in the sections of the rectal glands with their attendant flagellates. One wonders what type of indicator these *Leptomonas* might be? To what are they reacting in this medium? To the absorption of water? Sodium? Potassium? Chloride ions? It is interesting to speculate. It is rather nice if the study of parasites reveals something new about host physiology as well as morphology, and from this point of view alone I think it might be well worth while taking a closer look at the *Leptomonas* in fleas—whether we are dealing with one species or many, and whether for instance the species found attached to the proventricular region of the midgut is the same as the one pullulating in the rectal ampulla.

SALTATORIAL PERFORMANCE

From whatever angle you look at fleas you cannot fail to become interested—sooner or later—in their unusual mode of progression. About ten years ago I persuaded a research unit at the Royal Air Force Establishment at Farnborough to build a camera with which we obtained the first photographs of fleas in mid-air (Figs. 3 & 4). The pictures showed that as they begin their descent fleas spread out their legs, in much the same way as a bird or a butterfly spreads its wings to break its fall and control landing. Fleas are so small and light that they can be expected to somersault, twist, turn, pitch, roll and so forth once off the ground, and the observations we made on specimens touching down confirm this assumption. We watched the rat flea, *Nosopsyllus fasciatus* Bosc., jumping away from a source of bright light, and in a hundred jumps noted its landing performance. It came down on its feet no fewer than 78 times, which was a remarkably good effort, 17 times on its side and five times flat on its back. We never saw it pitch on its head. On 22 occasions the male flea landed facing in the direction from which it had come—that is to say pointing in precisely the wrong direction—and 60 times at right-angles to its would-be destination. On each occasion it reorientated itself by shuffling round and then, after a momentary pause, jumped again towards the shade. The females tended to travel a little further than the males, but fewer landed pointing in the right direction.

The importance of the jump in host-finding—the one vital leap from the substratum to the passer-by—was brought home to me by watching the saltatorial performance of a stick-tight flea, *Echidnophaga gallinacea* (Westwood), which once it has found a host never leaves it again and remains permanently fixed to the animal's head by its serrated mandibles. It is a small flea, and its jump averages a good 116 mm—that is to say about two hundred times the length of its own body. The rabbit flea, which is a semi-sessile species, is also no mean performer, with a maximum leap of 199 mm and an average of 64 mm. On the whole females of this species also jump somewhat further than the males, but they turn over in mid-air more frequently, and thus their landing performance is poorer.

One of the most fascinating aspects of fleas is the fantastic minor specialisations which overlie the basically rather similar plan of the Order. For instance, it pleased me greatly to find that wave frequency in the sperm tails of fleas varied from species to species. There are extremely subtle differences in the behaviour of fleas, too. For instance, many fleas are negatively phototropic, and move from the lighted side of a container towards the shade. If you compare a chart of the paths followed by 100 fed rat fleas and rabbit fleas all taking off from approximately the same spot and jumping towards the shade you will find a rather different pattern for each species. *Nosopsyllus fasciatus* follows quite a direct course, and at the end of 12 jumps all the fleas tend to be gathered at the same spot, having progressed along roughly parallel lines. The rabbit flea is far more erratic, and a few specimens even move towards the light source. Their paths zigzag, cross and re-cross, and it is difficult to follow a single individual's progress in the maze of lines. The plague-carrier *par excellence*, *Xenopsylla cheopis* Roths., is characterised by a chart showing a wide scatter. Most of the specimens, after describing a few loops and deviations, finish up near the shady side of the area, but at the end of 12 jumps they are relatively widely distributed.

Our best jumper in the laboratory was the sand martin flea (*Ceratophyllus styx* Roths.), which on an average spanned 200 mm. Bird fleas roughly fall into two categories, those with heavily sclerotised cuticles—which consequently appear

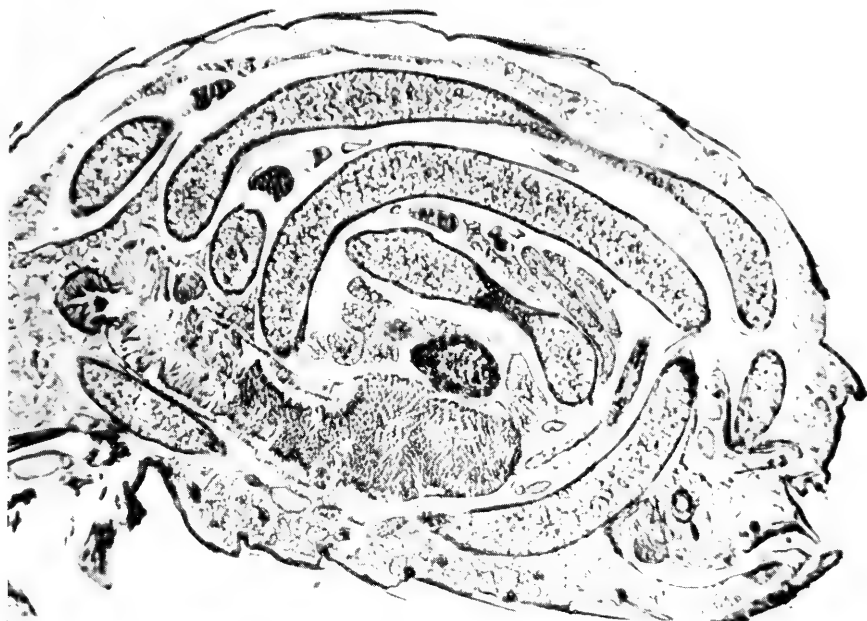


Figure 1: Longitudinal section (cut at 8μ) through the abdomen of a female rabbit flea, *Spilopsyllus cuniculi* (Dale), almost completely filled by coils of a mermithid worm ($\times 12$).

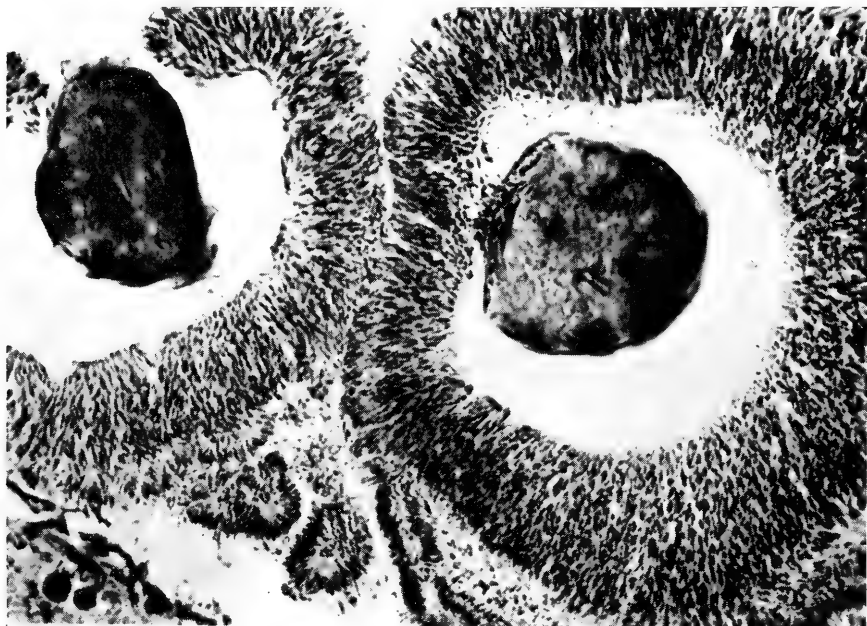


Figure 2: Longitudinal section (cut at 8μ) through the rectal ampulla of the flea *Stenoponia tripectinata spinellosa* Jordan, showing a halo of *Leptomonas* sp. surrounding the rectal glands. This effect could be an artifact, resulting from the fixing of the material ($\times 40$).



Figure 3: *Hystrichopsylla talpae* Curt. taking its own photograph by interrupting a narrow beam of light as it jumped. The camera was constructed at the Royal Air Force Experimental Station and consisted of a bank of 1" lenses with overlapping fields that covered the entire glass cell (9" long, 7" high and 1" thick) in which the flea jumped.



Figure 4: The rat flea, *Nosopsyllus fasciatus* Bosc. jumping; spreading its legs during its descent.

very dark, almost black—which are excellent jumpers and which disperse actively from the nests in which they hatch, and the pale, feebly-sclerotised species which are poor jumpers, do not migrate from the nest and depend for their future on the return of their hosts to old nesting sites. Darskaya (1954) discovered that the first type of bird flea has a rapid digestion of blood, and the second type a very slow one, and in fact can withstand long periods of starvation. Morphologists, such as Karl Jordan, noticed that the non-jumpers among these fleas lacked a pleural arch, and deduced quite correctly that the loss of this structure (situated above the pleural ridge in the metathorax) was correlated with the loss of their jumping ability. *C. styx*, of course, belongs to the first category. It not only migrates over the cliff face in search of new nests, but it can also jump on to sand martins hovering in front of their burrows (Bates, 1962).

Fleas, like the majority of parasitic insects, have in the course of evolution lost their wings. But they have retained certain parts of their flight mechanism which have been incorporated into their jumping apparatus. Hence Charles Neville and myself (1967) once described fleas as insects which fly with their legs. One of the most important components of the wing of a flying insect such as the locust or dragonfly is the wing-hinge ligament, which is situated on the top of the pleural ridge and is composed of a substance known as resilin. Resilin is an elastic protein which stores and releases energy more efficiently than any known rubber, and which can deliver power faster than most actively contracting muscle. The wing-hinge ligament has been incorporated into the flea's pleural arch. If it is photographed in ultra violet light it glows with the characteristic blue light of resilin.

In fact one of the most vital and important modifications involved in the switch back from flying to a jumping mode of progression is the shift of the wing-hinge ligament from its normal dorsal position to a mid-lateral (metathoracic) situation, where it can serve as an energy store for driving the legs rather than the wings. The jump of the flea is too rapid (an acceleration of 200 gravities (Bennet-Clark & Lucey, 1967)) to be achieved by muscle contraction alone, and thus it is necessary to postulate some energy store such as that provided by the resilin in the pleural arch. In addition to the wing-hinge ligament the flea also has preserved its starter muscle and two or three of the direct flight muscles—but how the mechanism of the jump really operates is not known. Models have been produced which jump (Bennet-Clark & Lucey, 1967), but all that they have demonstrated satisfactorily is how the model—not the flea—works. We think we know now by what mechanism the energy is stored in the pleural arch, but how it is released at the moment of take-off and transferred from the compressed resilin to the leg—presumably by some form of click mechanism—remains a mystery. I used to think it was the sort of problem one might solve in the car day-dreaming in a traffic jam in Piccadilly. But I now know better. There are no short cuts. It is a question of getting down to the morphology of the flea. And if, secretly, you feel a trifle condescending towards this approach, try your hand at solving the jump of the flea, and you will regain a certain respect for the old-fashioned morphologist.

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FIELD MEETINGS

TROTTSCLIFFE, KENT—21st April 1968

Leader: Col. A. M. EMMET

The first field meeting of the year was favoured with brilliant sunshine and was attended by seven members. The main objective was *Acrolepia perlepidella* Staint., which Mr. E. S. Bradford had bred by chance in 1967 from *Inula conyza* DC. taken by him from this locality as food for the larvae of *Coleophora conyzae* Zell. *A. perlepidella* mines the leaves of this plant and several possible mines were discovered; however no moths were bred. Two cases of *Coleophora niveicostella* Zell. were found on thyme but were not bred, and among the moths taken on the wing was a specimen of *Ancylis unculana* Haw. The warm sunshine brought out many early butterflies among which *Gonepteryx rhamni* L. was conspicuously plentiful.

CHOBHAM COMMON, SURREY—27th April 1968

Leader: Mrs. F. M. MURPHY

A party of 13 met at Sunningdale station and drove to the car park at the cross-roads near Fox Hill. The area worked was to the north-east of the car park. This is a region of heather-covered slopes with a stream surrounded by willow carr and a separate area of valley bog. A bad fire had devastated much of the common shortly before the meeting, but fortunately most of our area had escaped. The day was overcast and there was intermittent drizzle in the afternoon.

Mr. S. Wakely and Mr. J. A. C. Greenwood kindly submitted lists of Lepidoptera. Mr. Wakely says that of the Lepidoptera the most interesting find was *Adela cuprella* Thunb., and adds that this great rarity used to be taken on Wimbledon Common.

The following species were included in the lists mentioned: *Pieris rapae* L., *Pararge aegeria* L., *Nymphalis io* L., *Plebejus argus* L. one larva swept, *Achlya flavicornis* L. larvae on birch, *Dasychira fascelina* L. larvae swept from heather, *Lasiocampa quercus* L. larvae on birch, *Gastropacha quercifolia* L. larva, *Amathes castanea* Esp. larva swept from heather, *Anarta myrtilli* L., *Archiearis parthenias* Hübn. larvae, *Geometra papilionaria* L. larvae on birch, *Pachynemia hippocastanaria* Hübn. *Ematurga atomaria* L., *Buckleria paludum* Zell. larva on *Drosera rotundifolia* L., *Swammerdamia heroldella* Hübn., *Coleophora juncicolella* Staint. larvae on heather, *C. ibipennella* Zell. larvae on birch, *Adela cuprella* Thunb. and *Incurvaria pectinea* Haw. was common.

Mr. Stubbs reports the following dipterous captures:

Tipula subnodicornis Zett, both sexes were taken in the valley bog, a bog of *Juncus acutiflorus* Hoffman and *Sphagnum*. This is a common species in such terrain in upland districts of Britain, and as recently as this year, R. M. Payne (1968, *Ent. Gaz.*, 19:38) has stated that this species is 'certainly confined to upland areas' though overlooking a New Forest record by Coe (1950, *Handbk. Identification Brit. Ins.*, 9(2)). He adds that he took a single male on Thursley Common last year as well as specimens at Chobham.

In the willow wood by the stream the crane fly *Limnophila punctata* Schrank was common and a single *Limonia dilutior* Edwards was taken. The latter is uncommon and it was not found among broom which is the habitat indicated for it by R. L. Coe (1950, *loc. cit.*).

Among the Heteroptera a single specimen of *Chartoscirta cocksi* (Curt.) was found running over wet mud beside the stream under the willow; and *Cymus glandicolor* Hahn was swept from *Carex paniculata* L.

The leader took (or in the case of immatures noted) the following spiders (f=female, m=male, imm=immature):

Dictyna arundinacea (L.), f, m, on heather; *Clubiona diversa* O.P.-Camb., m from valley bog; *Phrurolithus festivus* (C.L.K.), m from heather or gorse; *Xysticus cristatus* (Clerck), m from heather; *X. lanio* C.L.K., m from *Carex paniculata* near stream; *Philodromus histrio* (Latr.), imm on heather; *Neon reticulatus* (Bl.), f from *Carex paniculata*; *Evarcha arcuata* (Clerck), f from heather; *Oxyopes heterophthalmus* Latr., imm on heather; *Lycosa amentata* (Clerck), f from willow carr; *L. nigriceps* Thor., m wandering over valley bog; *Arctosa perita* (Latr.), imm, species typical of sand dunes and sandy heaths; *Pisaura mirabilis* (Clerck), imm wandering everywhere; *Theridion saxatile* C.L.K., imm from heather; *Araneus umbraticus* Clerck, f from under bark; *A. redii* (Scop.), imm on heather, *Mangora scalypha* (Walck.), imm on heather, this and the previous species are very common

on heather; *Cornicularia unicornis* (O.P.-Camb.), f from sallow carr; *Lophomma punctatum* (Bl.), f from heather; *Bathyphantes approximatus* (O.P.-Camb.), f from valley bog; *Taranucus setosus* (O.P.-Camb.), f, m from deep in *Sphagnum* of valley bog; *Lepthyphantes mangei* Kulcz, f from sallow carr.

It was disappointing that *Thomisus onustus* Walck. which the leader has taken on Chobham Common on other occasions was not found.

FARNBOROUGH, SURREY—4th May 1968

Leader: Mr. M. P. CLIFTON

This meeting, attended by 23 members and friends, started out in fine weather, but by lunch time it had clouded over and by 3 o'clock had to be abandoned because of rain. The major feature of this meeting was the lack of all forms of life. One butterfly, a *Pyrgus malvae* L., was found, along with several common beetles. The only animals in any numbers were the Nightingales on the canal bank, all singing. Tea was provided at the leader's house after the meeting.

SPRING COLLECTING AT PORTLAND

Leader: Col. A. M. EMMET

Seven members of the Society visited Portland and the adjoining stretch of Chesil Beach in early May. The party consisted of Capt. J. Ellerton and Messrs. S. Wakely, J. M. Chalmers-Hunt, A. M. Emmet, R. W. J. Uffen, R. Fairclough and his son Alan. They assembled at about noon on Saturday, 11th May; the Faircloughs had to leave at midday on Sunday, but the remainder stayed on until Monday morning.

The season was a late one. The weather on Saturday was mainly overcast with a trace of rain; Sunday was sunny throughout, but with a fresh, cool, southerly wind; while on Monday, after rain during the night, it was cold, damp and squally, with the cloud base down to 300 ft. The low temperature and strong wind certainly lessened the number of insects on the wing, but the main object was to collect larvae. Since all the members of the party were microlepidopterists they concentrated mainly on the smaller moths.

The following list may help others who plan to visit Portland at the same time of year. Where a species is named without comment, it indicates that the imago was observed on the wing. Most of the collecting was done at Ope Cove and other spots on the eastward-facing cliffs; the western slopes were harder to work and less productive.

PORTLAND: *Nymphalis io* L.; *Cupido minimus* Fuessl.; *Pyrgus malvae* L.; *Erynnis tages* L., imagines and a pupa which produced an imago on the 25th May; *Lasiocampa quercus* L., larvae; *Nudaria mundana* L., larvae relatively scarce on stones; *Fumaria casta* Pall., larval case on a stone; *Pyrausta cespitalis* Schiff.; *Mecyna asinalis* Hübn., several larvae of varying sizes on *Rubia peregrina* L., probably common, but the larvae are rather hard to find.

Epischnia banksiella Rich., larvae locally common on *Inula crithmoides* L. Two methods of feeding are described—Beirne (1952, *Brit. Pyralid and Plume Moths*, p. 92) says 'In spring it spins the tops of the shoots together in a conspicuous manner'; while Ford (1949, *A Guide to the Smaller Brit. Lepidoptera*, p. 11) states

'In silken galleries at the base of *Inula crithmoides* growing amongst limestone rocks'. Both accounts are correct, but the fact that almost all those found by the party answered to Beirne's description seems to indicate that the larvae prefer last year's stems, on which it makes its gallery high up amongst the dead leaves; from this position the new growth is easily accessible to it. Where tall stems are not available, it has, of course, to adapt its habits and makes its tube low down, even on the ground. The well-grown plants growing right up against the face of the cliff seem to be preferred.

Euzophera cinerosella Zell., larvae common in the lower stems and roots of the larger plants of *Artemisia absinthium* L. in all three of the localities where it was looked for; *Agdistis staticis* Mill., larvae and a pupa on *Limonium binervosum* (G. E. Sm.) C. E. Salmon. It prefers well-grown plants on sheltered ledges or in recesses except in one patch, which harboured 18 larvae, it seemed scarce; however, most of the likely clumps of *Limonium* are inaccessible.

Adaina microdactylus Hübn., pupae in stems of *Eupatorium cannabinum* L.; *Oidematophorus carphodactylus* Hübn., larvae fairly common in *Inula conyza* DC.; *Lozopera francillana* F., in stems of *Daucus carota* L.; *Phalonia tesserana* Schiff.; *P. williana* Brahm (*zephyrana* Treits.), two imagines; *Cacaecimorpha pronubana* Hübn., larval spinings not rare on *Euphorbia amygdaloides* L., one imago; *Eucosma pupillana* Clerck, larvae in the lower stems and roots of *Artemisia absinthium* L., where it appears to be less common than *Euzophera cinerosella* Zell. The larva is yellowish white, contrasted with the clear white or greyish white of *E. cinerosella*.

Acroclita subsequana H.-S. (*consequana* H.-S.), one imago, more might have been seen but for the cold wind. The foodplant at Portland (according to Mr. Wakely) is the Portland Spurge (*Euphorbia portlandica* L.) and not the Sea Spurge (*E. paralias* L.) as stated in the text books; *Ancylys comptana* Fröl., imagines common, the local form is well marked; *Metzneria carlinella* Staint., larvae or pupae locally abundant in the older heads of *Carlina vulgaris* L. (many larvae in each infested head); *Aristotelia brizella* Treits., two imagines; *Scrobipalpa plantaginella* Staint., larvae fairly common in *Plantago coronopus* L., both on the cliffs and on level grassy ground; *S. ocellatella* Boyd., larvae less common than on Chesil Beach; *Mompha misella* Schiff., one imago; *Agonopterix pallorella* Zell., one overwintered imago; *A. nanatella* Staint., larval mines locally common on *Carlina vulgaris* L.; *Anthophila fabriciana* L., larvae common on *Parietaria diffusa* Mirt & Koch (*officinalis* auct); *Elachista rufocinerea* Haw.; *E. argentella* Clerck; *Coleophora albitarsella* Zell., cases locally common in *Origanum* at Ope Cove; *C. conyzae* Zell., cases not rare on *Inula conyza* DC.; *Coleophora* sp., several cases of the 'troglodytella' group were found on *Inula conyza* DC.; *Aspilapterix tringipennella* Zell., larval mines common on *Plantago lanceolata* L.; *Monopis rusticella* Hübn., one imago; *Meesia richardsoni* Wals., extensive searching of the underside of stones proved abortive, though members of the party who had visited the 'island' in the autumn of previous years recorded that the cases were to be found commonly at that time of the year. Possibly the larvae chose some surface other than the stone on which to pupate, the single case found was attached to an old cocoon (probably of one of the ermines) spun onto the rock.

Mr. Uffen submitted the following note: In September the larvae were common in deep piles of limestone boulders. The top layer harboured *Petrobius*, whilst *M. richardsoni* shared the underside of the second layer with larvae of *N. mundana*; apparently only this situation gives sufficient light and humidity for the green algal film to develop. Neither species was found where the green film was

anything more than a tenuous discoloration of the stone. On our recent visit, I searched piles of stone still harbouring *N. mundana* larvae no bigger than those seen in the autumn, but *M. richardsoni* could not be found at any level in these piles.

Teichobia verhuellella Staint., larvae on *Phyllitis scolopendrium* (L.) Newm. (*Scolopendrium vulgare* (Sm.)); *T. filicivora* Meyr., bred from leaves of *Phyllitis scolopendrium*, on which *T. verhuellella* was also feeding—this species was unexpected, especially as the usual foodplant is *Dryopteris filix-mas* (L.) Schott.

CHESIL BEACH: *Scrobipalpa suaedella* Rich., larvae common in spinings on *Suaeda fructicosa* Forsk.; *S. ocellatella* Boyd., larvae common on *Beta maritima* (L.) Threll.; *Caryocolum inflatellum* Chrét. (*leucomelanella* auct.), larvae common on *Silene maritima* With., preferring, apparently, the smaller, lower and less vigorous plants directly over the shingle; *Aproaerema anthylidella* Hübn., leaves of *Anthyllis* blotched by this species were common, but most of the larvae had gone; *Elachista rufocinerea* Haw.; *E. argentella* Clerck.; *Coleophora discordella* Zell., cases on *Lotus*, but very unevenly distributed, present only in a few of the islands of vegetation on the shingle, but on these tending to be abundant; *Aspilapterix tringipennella* Zell. larval mines common on *Plantago lanceolata* L.

MICKLEHAM, SURREY—12th May 1968

Leader: Mr. B. F. SKINNER

Only two members met the leader and his wife at Boxhill station. The small party proceeded eastwards along the railway line towards the south-facing slopes of Norbury Park. Beating the Common and Wych Elms en route produced larvae of *Thecla w-album* Knoch, *Agrochola circellaris* Hufn., *Cosmia trapezina* L., and *C. affinis* L.

The rest of the morning was spent on the downland slopes where 17 species of butterflies were noted, of which *Gonepteryx rhamni* L. was by far the commonest. Other interesting species seen were *Callophrys rubi* L., *Hamearis lucina* L., *Euchloe cardamines* L., and *Pararge aegeria* L.

Around midday the party returned to Boxhill station and travelled by car to the water meadows near Abinger where, after lunch, a good many *Xanthorhoe biriviata* Borkh. were flushed from their food plant, *Impatiens capensis* Meerb.

The remainder of the meeting was spent on the top of Boxhill where beating Yew produced a few larvae of *Eilema deplana* Esp., *Cleora abietaria* Hübn. and *C. repandata* L.

COSFORD MILL, THURSLEY, SURREY—19th May 1968

Leader: Mr. J. A. C. GREENWOOD

The weather before this meeting had been cold and wet and the season was backward. The day immediately preceding the meeting had brought almost continuous rain to the area, so that we were lucky to have relatively fine weather with only one brief shower late in the afternoon and a few minutes of quite warm sunshine.

Twelve members accompanied the leader and spent a very pleasant few hours in working this remarkable locality.

All stages of Lepidoptera were scarce but 8 species of butterfly were seen including an early *Lycaena phlaeas* L. and a single worn *Celastrina argiolus* L., a species which has been generally scarce in this area in recent years.

Larvae too were much less numerous than usual, no doubt due to the low temperatures during the previous weeks. It is worth recording that the workings of *Sphecia bembiciformis* Hübn. were found in the stem of a large willow bush.

Mr. Hammond reports that the syrphid, *Rhingia macrocephala* Harris, was abundant. He also recorded *Criorhina berberina* F. and its variety *oxyacanthae* Meig. (both bumble bee mimics), the Honey Bee mimic, *Sericomyia lappona* L., and the wasp mimic, *Chrysotoxum cautum* Harris. The tiny syrphid, *Neoascia podagrica* F., was common in the alder swamp. Another very small species, *Paragus tibialis* Fall., was also taken. The large tipulids, *Tipula maxima* Poda and *Pedicia rivosa* L., were also present.

As usual, Mr. and Mrs. Loarridge entertained the party to a magnificent tea which was greatly enjoyed by us all.

ARUNDEL, SUSSEX—25th May 1968

Leader: Mr. M. P. CLIFTON

This field meeting had a very damp start as rain lasting about 16 hours stopped just as the meeting commenced. Before lunch a chalk quarry was investigated but produced nothing as the vegetation was far too wet. After lunch things had begun to dry and a few flies were seen. A dead rabbit produced a large number of beetles and one member took a number of geometrid moths. As the meeting ended the sun came out. Tea was provided at the leader's house. Fifteen members and friends attended.

WATLINGTON HILL, OXON.—1st June 1968

Leader: Mr. G. PRIOR

The rendezvous for the meeting was the same as last year, the escarpment of the Chilterns where the Watlington to Christmas Common road crosses the Ickneild Way, but unlike last year the weather was of the best; hot, with bright sunshine all day. Seven members attended. The sites worked were: a rough field and an old abandoned chalk workings on one side of the road, and a chalk hill with woods on the crest, on the other side of the road. *Callimorpha jacobaeae* L. swarmed everywhere in great numbers, mostly well-worn, but the normal food-plant, *Senecio jacobaea* L., appeared to be completely absent this year, having perhaps been eradicated by last year's fine crop of larvae. *Gonepteryx rhamni* L. was also seen flying in fair abundance, replacing here the common whites. *Callophrys rubi* L. was also a welcome sight, though not common. Various Larentiinae (Carpets) were seen flying in large numbers, and Mr. J. A. C. Greenwood obtained larvae of *Eupithecia sobrinata* Hübn. by searching the Junipers, *Juniperus communis* L. Mr. Martin Collins provided the list of Coleoptera, a piece of good fortune which we did not have last year; and Mr. E. S. Bradford listed the Lepidoptera.

LEPIDOPTERA: *Pieris brassicae* L., *Gonepteryx rhamni* L., *Coenonympha pamphilus* L., *Polyommatus icarus* Rott., *Pyrgus malvae* L., *Anthocaris cardamines* L.,

Erynnis tages L., *Callimorpha jacobaeae* L., *Ectypa glyphica* L., *Euclidimera mi* Clerck, *Phytometra viridaria* Clerck, *Xanthorhoe fluctuata* L., *Epirrhoe rivata* Hübn., *E. galiata* Schiff., *Chiasma clathrata* L., *Pyrausta nigrata* Scop., *P. aurata* Scop., *Crambus pratellus* L., *Syndemia musculana* Hübn., *Dichrorampha plumbagana* Treits., *Grapholita jungiella* L., *Pammene rhediella* Clerck, *Griselda stagnana* Schiff., *Chrysoclista flavicaput* Haw., *Panalia leuwenhoekella* L., *Elachista argentella* Clerck, *Coleophora alcyonipennalla* Koll. larval cases on *Centaurea* sp., *Coleophora* sp. larval cases on *Crataegus*, *Aspilapteryx tringipennella* Zell., *Nemophora swammerdamella* L.

COLEOPTERA: *Cantharis nigricornis* Müll., *Rhagonycha lignosa* Müll., *R. limbata* Thoms., *Malthinus frontalis* Marsh., *Phyllobius urticae* Deg., *Apion carduorum* Kirby, *Ceuthorynchus quadrimaculatus* L., *Sitona tibialis* Herbst., *Athous haemorrhoidalis* F., *Cassida sanguinolenta* Müll., *Tachyporus chrysomelinus* L., *Tachinus marginellus* F., *Stenus similis* Herbst., *Oxytelus laqueatus* Marsh., *Philonthus fimetarius* Grav., *Plateumaris affinis* Kunze, *Lathridius nodifer* Westw., *Meligethes aeneus* F.

ARACHNIDA: *Araneus cucurbitinus* Clerck, *Heliophanus flavipes* Koch., *Tetragnatha nigrata* Lendl.

HEMIPTERA: *Legnotus picipes* (Fall.).

BROWNDOWN, HANTS—16th June 1968

Leader: Mr. B. GOATER

Unfortunately, only one other member met the leader at the rendezvous at Fareham, and it was not until late in the afternoon that the Rev. David Agassiz was able to reach the collecting ground. The weather remained overcast all day, and diurnal insects were disinclined to fly. One specimen of *Hadena lepida* Esp. was found resting under an old railway sleeper on the shingle, and larvae of *Pseudoterpna pruinata* Hufn. and *Eupithecia nanata* Hübn. were detected on gorse and ling respectively. In the marsh, the larvae of *Acleris lorquiniana* Dup. were plentiful in spun shoots of *Lythrum salicaria* L., and the webs of *Nephopteryx genistella* Dup. were to be found in the large gorse bushes on the adjacent heathland. Good series of both these insects were subsequently bred.

BIX BOTTOM, OXON.—22nd June 1968

Leader: B. R. BAKER

It was unfortunate that the day chosen to visit this 247-acre reserve of the Berkshire, Buckinghamshire and Oxfordshire Naturalists' Trust in the Chilterns should have been one of almost constant rain.

Some of the members assembled at Henley station and were driven to the reserve, to be joined by others on the site, making a party of 12.

The honorary warden, Mrs. V. Paul, spoke to members about the special features of the area, and kindly allowed us to join in a conducted tour arranged for a local group during the afternoon, and which in spite of the weather, allowed members to see the following plants: *Ophrys apifera* Huds. (Bee Orchid), *Blackstonia perfoliata* (L.) (Yellow Wort), *Orobanche minor* Sm. (Lesser Broomrape), *Odontites verna* (Bell) Dum. (Red Bartsia), *Platanthera chlorantha* (Cust.) Rchb.

(Greater Butterfly Orchid), *P. bifolia* (L.) Rich. (Lesser Butterfly Orchid), *Ophrys insectifera* L. (Fly Orchid), *Dactylorchis fuchsii* Verm. (Spotted Orchid), *Listera ovata* R. Br. (Twayblade), *Lithospermum officinale* L. (Gromwell), *Atropa belladonna* L. (Deadly Nightshade), *Polygonatum multiflorum* (L.) All. (Solomon's Seal), *Alchemilla vulgans* agg. (Ladies Mantle), *Paris quadrifolia* L. (Herb Paris), *Poa nemoralis* L. (Wooded Poa), and the sedges, *Carex pallescens* L., *C. pilulifera* L. and *C. sylvatica* Huds.

The entomologists were more adversely affected by the weather, but Mr. R. W. J. Uffen has kindly supplied the following list:

DIPTERA: *Agromyza rufipes* Meig. mines in leaves of *Lithospermum officinale* L.; *Liriomyza pascuum* Meig., mines in leaves and bracts of *Euphorbia amygdaloides* L.; *Tipula flavolineata* Meig., larvae in rotten wood; *Limonia nubeculosa* Meig.; *Erioptera squalida* Loew; *Nephrotoma quadrifasciaria* Meig.; and *Austrolimnophila ochracea* Meig.

LEPIDOPTERA: *Apatele psi* L., *Apatele alni* L. small larva on birch. *Platyptilia pallidactyla* Haw., *Pterophorus galactodactylus* Schiff., *Crambus nemorellus* Hübner., *Chrysoteuchia culmella* L., *Mompha raschkiella* Zell. leaf mines, *M. conturbatella* Hübner. larvae, *Ornix betulae* Staint, larvae and *Coleophora alnifoliae* Barasch larvae on a birch seedling.

NEUROPTERA: *Chrysopa perla* (L.).

BRECK, SUFFOLK—7th July 1968

Leader: Mr. B. GOATER

This meeting took place in hot, sunny weather, and was attended by five members and two visitors, who gathered at the large roundabout at Barton Mills. While the party was assembling, those already present looked at the waste ground next to the roundabout, on which a number of interesting plants were growing. The most spectacular of these was a fine specimen of the thistle, *Onopordum acanthium* L., which seems to be quite widespread, though thinly scattered, in the area.

The morning was spent at Lakenheath Warren, an extensive area of calcareous sand with young pine. The thin turf was rich in lichens, bryophytes (including a great rarity, *Eurhynchium pulchellum* (Hedw.) var. *praecox* (Hedw.)) and small flowering plants. The most interesting Lepidoptera were *Lygephila pastinum* Treits. which was disturbed in numbers from long grass in one small area, *Mesotype virgata* Hufn., common, *Anania verbascalis* Schiff., *Crombrughia distans* Zell. and a fresh though badly deformed specimen of *Euschesis orbona* Hufn. Other species recorded here included *Pararge megera* L., *Maniola jurtina* L., *Coenonympha pamphilus* L. common, *Lycaena phlaeas* L., *Pyrausta cespitalis* Schiff., *Homeosoma sinuella* F., *Crambus perlellus* Scop., *C. hortuellus* Hübner., *Agriphila culmellus* L., *A. inquinatellus* Schiff., *Coleophora chalcogrammella* Zell., *C. lixella* Zell., and abundant larvae of *Callimorpha jacobaeae* L.

Several Whinchats were seen in a bracken part of the Warren, and they were evidently breeding in the vicinity.

After lunch the party moved on to Icklingham, stopping on the way to examine some large fields of lucerne which produced nothing of interest, only several *Chiasmia clathrata* L. At Icklingham, a few larvae of *Anepia irregularis* Hufn. were discovered, and it was pleasing to note that the food-plant seemed to have

recovered from the wanton spraying it had received earlier in the year. Plenty of larvae of *Lithostege griseata* Schiff., mostly full fed, were found on flixweed, *Descurainia sophia* (L.) on which were also several small, open network cocoons containing lepidopterous pupae. These eventually produced *Plutella maculipennis* Curt.

This area of Breckland is well-known for its Stone Curlews, and one member of the party saw no less than eight of these fine birds in an area of about two square miles. Earlier in the year, some of the slopes had been blue with a carpet of Purple Milk-vetch, *Astragalus danicus* Retz. and there was still a good quantity in flower.

The last area to be visited, briefly, was Chippenham Fen in Cambridgeshire, where *Eustrotia bankiana* F. was flying in numbers despite the fact that the sun had now gone. *Rivula sericealis* Scop., *Jaspidea pygarga* Hufn., *Zanclognatha cribumalis* Hübn., *Cybosia mesomella* L. and several *Aphantopus hyperantus* L. were also seen.

MOULSFORD, BERKS—20th July 1968

Leader: Capt. J. ELLERTON

Five members met on a fairly reasonable, but by no means perfect, day. As we left our cars and walked up a private road, the verges unsprayed by a rapacious local authority, the first insect we saw was a female *Gastropacha quercifolia* L. resting on a grass stem; she submitted to photography from every angle and then it was observed that she had oviposited both on the grass stem and also on a nearby thistle. The ova hatched about a fortnight later.

We then worked our way up the downland slopes, well grazed but with plenty of flowers about, towards the clumps of Juniper bushes where some hoped, alas in vain, to find *Phalonia rutilana* Hübn.

The usual hillside butterflies were seen and also colonies of *Melanargia galathea* L. and *Lysandra coridon* Poda.

The hillside yielded various microlepidoptera; amongst them *Ancylys comptana*, Fröl., *Griselda stagnana* Schiff., *Stomopteryx taeniolella* Zell., *Pyrausta cespitalis* Schiff. and *Agriphila inquinatellus* Schiff. From the Juniper *Dichomeris marginellus* F., *Argyresthia abdominalis* Zell. and *Batia lunaris* Haw. were taken.

HACKHURST DOWNS, SURREY—4th August 1968

Leader: Mr. R. F. BRETHERTON

Eleven members met at Gomshall station and took the footpath to the down. A fine drizzle fell until lunchtime, and thereafter there was no sunshine and the vegetation remained too wet for effective collecting. Only six species of butterflies were seen, mostly at rest, but they included enough of both sexes of *Lysandra coridon* Poda to show that the colony is still flourishing. The chalk-loving geometer, *Melanthia procellata* Schiff., was taken, together with several nice plume moths, *Oidematophorus lithodactylus* Treits.; and as the party walked down the lane towards the station several fresh *Eupithecia inturbata* Hübn. were disturbed from the maples. Several species of Coleoptera were also collected. There was a

fine show of *Campanula trachelium* L. (Nettle-leaved Bellflower) on the railway embankment.

After lunch Mr. Mackworth-Praed and Mr. F. Reynolds joined the party in their capacities of Treasurer and Conservation Officer of the Surrey Nationalists' Trust, and there was a useful discussion of what might be done, with the permission of the National Trust who own the land, to check the spread of scrub and long grass, so as to relieve the old-established bushes of *Juniperus communis* L. (Juniper) and to provide more open ground for the colony of *Lysandra coridon* Poda.

The party adjourned for tea—and to dry off—with Mr. and Mrs. Bretherton at Bramley.

NETLEY HEATH, SURREY—31st August 1968

Leader: Mr. R. W. J. UFFEN

Six members and the family of one met at Horsley station on a day for which Her Majesty's meteorologists had made dire predictions for those who travelled abroad. In the event, we found shelter from the wind, had intermittent sunshine and were lucky that the only shower sufficient to dampen the vegetation came just as the last of the party was departing.

The party explored a dry valley running back generally to the north, from Netley Heath (grid TQ089494) to Effingham Forest. Collecting was confined to the southern half of the valley. The sides of the valley show chalk vegetation in the open parts, whilst there is a downwash of sand from Netley Heath on the higher ground to the south and wetter ground with clay topsoil further east than we explored.

The valley is now managed in part by the Economic Forestry Group and part by the Forestry Commission. The usual decimation of the former hardwoods is proceeding apace and dense stands of pine and larch with some marginal cypress are going in. Further north, there is a big area of sycamore, but we did not visit this.

Recently cleared areas on chalky soils showed good growths of marjoram and St. John's Wort, with *Torilis japonica* (Houtt.) DC. and a magnificent stand of *Angelica sylvestris* L. On other soils *Senecio jacobaea* L. was the conspicuous flower, whilst everywhere *Carduus acanthoides* L. and *Cirsium vulgare* (Savi) Ten. flourished.

Some time was spent examining the visitors to the flowers of *Angelica*. Hoverflies were abundant (a list of species is appended), the great majority being females. *Lucilia* greenbottles and apparently very well fed *Calliphora* bluebottles abounded, but there were very few sawflies and little else.

Only a few ubiquitous butterfly species were seen and beating and sweeping produced very little. Some big hardwood trunks had been left lying in the timber-yard area for some years. These appear to have been felled whilst still sound trees and are rotting but slowly from the outside. Millipedes and woodlice abound under the bark, but the only two insect species found, *Microscardia boleti* F. caterpillars and a small species of beetle, were attacking the fungus *Polystictus versicolor* L. Fr.

Insects on *Angelica* flowers: *Platycheirus albimanus* F., *P. scutatus* Meig., *Melanostoma scalare* F., *M. mellinum* L., *Sphaerophoria scripta* L., *Syrphus vitri-*

pennis Meig., *S. glaucius* L., *S. balteatus* Deg., *S. cinctellis* Zett., *S. labiatarum* Verrall, *Rhingia campestris* Meig., *Cheilosia scutellata* Fall., *Sericomyia silentis* Harris, *Eristalis pertinax* Scop. (abundant), *E. tenax* L. (scarce); *Ernestia radicum* F. (Tachinidae); *Selandria serva* (F.), *Tenthredo marginella* F., *T. arcuata* group (Tenthredinidae). Insects taken nearby included *Myiatropa florea* L., *Xylota sylvarum* L., *Siphona cristata* F., *Phyllomyia volvulus* F., *Trypeta tussilaginis* (F.), *Tipula paludosa* Meig., *Dicranomyia decemmaculata* Loew, *Tipula flavolineata* Meig. (larvae in a fallen bough), *Strangalia quadrifasciata* (L.), *Platycis minuta* (F.).

BROCKHAM, SURREY—8th September 1968

Leader: Mr. R. FAIRCLOUGH

Six people attended, in warm weather with hazy sunshine developing. The old and very impressive chalk quarry (grid ref. TU200510) was worked, together with an area of tall hawthorn and other thicket between fields immediately to the south. The spoil heaps in the quarry support a thick turf of chalk-loving plants, with tall species such as *Pimpinella saxifraga* L. veiling them with white flowers.

Larvae of *Coleophora trifolii* Curt. (*frischella* auct.) were found locally on a widespread melilot. A few common butterflies were seen with one late *Hesperia comma* L. Moths on the wing were few: *Lithocolletis scabiosella* Doug. (several), *Macroglossum stellatarum* L., *Colostyia pectinataria* Knoch, *Ortholitha bipunctaria* Schiff.

Sweeping produced one larva of the *Tenthredo arcuata* group, one *Rhynchista prolixa* Meig. (a parasite of Pyralidae) and a few other insects outside the interests of those present. Rain the day before could have caused the insects to remain low in the vegetation.

All indulged in the satisfying occupation of whacking trees in the thicket, ostensibly to knock out the variable tortricid moth *Acleris cristana* Schiff. Only nine were taken, however, with only a few *Acleris schalleriana* L. (and larvae), *A. sparsana* Schiff., *A. latifasciana* Haw., *A. variegana* Schiff., *A. emargana* F., *A. rhombana* Schiff., *Epinotia nisella* Clerck, *Ypsolophus radiatellus* Don., *Y. sequellus* Clerck.

STANFORD-LE-HOPE, ESSEX—15th September 1968

Leader: Mr. E. S. BRADFORD

Only two members and one visitor arrived at Stanford-le-Hope station in pouring rain, which was to prove disastrous to the southern counties of England. No further members appeared when the train arrived but the acquaintance was made of Mr. R. Tomlinson, a local entomologist in the station waiting room.

It was in and around the waiting room that the first part of the meeting took place. Several moths were seen on the ceiling and walls, being attracted to the lights there during the evening and night. After another inspection several more were discovered, and a more detailed scrutiny of the ceiling, walls and floor revealed more cunningly concealed Lepidoptera. In the end a total of 11 species and 25 specimens were noted as well as three dead specimens. These were *Noctua pronuba* L., *Calothyranis amata* L., and *Sterrhia aversata* L. The living specimens

were of *Amathes c-nigrum* L., *A. xanthographa* Schiff., *Leucania pallens* L., *Luperina testacea* Schiff., *Phlogophora meticulosa* L., *Amphipyra tragopogonis* Clerck, *Plusia gamma* L., *Hypena proboscidalis* L., *Eupithecia linariata* Schiff., *Opisthograptis luteolata* L. and *Mesographe forficalis* L.

From the station, the party, including Mr. Tomlinson, and still in pouring rain, moved off to an area of reed beds. Mr. Tomlinson mentioned them and said he would be pleased to show us there. However, the leader had to retire after a very short period to the haven of a church doorway, being drenched through. The remaining entomologists, being better attired, braved a short excursion but soon returned. Very little could be done in the continuous downpour. Near the church doorway and on a wall nearby were specimens of *Xanthorhoe fluctuata* L. and *Endrosis sarcitrella* L.

As it was early Mr. Tomlinson invited us to his home for a cup of tea and to see his collection of Lepidoptera, a large percentage of which were of local origin. On the way there a specimen of *Gortyna micacea* Esp. and one of *Caradrina ambigua* Schiff. were seen on shop windows. A couple of hours passed viewing some most interesting insects in Mr. Tomlinson's collection before it was decided to return home.

From Stanford-le-Hope it was discovered that roads were closed, owing to floods, and that there was just one road open. After negotiating some flooded sections of road and observing stretches of countryside in the same condition, the members of the party arrived safely home; and it was still raining.

WHITE DOWN, SURREY—6th October 1968

Leader: Mr. E. S. BRADFORD

After a period of poor conditions the weather turned a kind face to the eight members and one visitor who met at Dorking station for the meeting.

The party left Dorking, and on arrival at White Down were fortunate in finding a place to park their cars. The morning was spent on the White Down where numbers of the larvae of various species of Lepidoptera were found, mainly microlepidoptera. They included *Thiotricha subocellea* Steph., *Diurnea fagella* F., *Coleophora albitarsella* Zell., *C. discordella* Zell. and *Stigmella oxyacanthella* Staint.

During a break for refreshment two members of the reptilia were discovered enjoying the sunshine. The first, a specimen of the common lizard (*Lacerta vivipara* Jacquin) was basking at the foot of a gate post. It allowed its photograph to be taken and was then caught and sexed by Mr. P. A. Goddard, the visitor to the party. It proved to be a female. The other, an adder (*Vipera berus* L.) did not prove so co-operative, and when almost within photographic distance, slid off into the undergrowth. It was a rich reddish brown and was probably also a female.

After refreshment an area to the west of the road leading to Deer-leap Wood was worked but nothing of any note was discovered. A number of larvae of *Stigmella cathartica* Staint. were found in the leaves of *Rhamnus catharticus* L.

Other Lepidoptera seen or taken during the day were: *Gonepteryx rhamni* L., *Maniola jurtina* L. *Vanessa atalanta* L., *Aglais urticae* L., *Plusia gamma* L., *Nomophila noctuella* Schiff and *Acleris sparsana* Schiff.

The meeting broke up later in the afternoon after a very pleasant day.

PROCEEDINGS

13th JUNE 1968

The President, Mr. B. GOATER, in the Chair

EXHIBITS

Dr. C. G. M. DE WORMS—The following larvae: *Nyssia zonaria* Schiff. (Lep., Geometridae) and *Xylena vetusta* Hübn. (Lep., Noctuidae) from Conway, N. Wales, and *Ptilophora plumigera* Schiff. (Lep., Notodontidae) from Kent.

COMMUNICATIONS

Dr. DE WORMS said that he had seen *Lysandra bellargus* Rott. (Lep., Lycaenidae) in some numbers on Hod Hill, Dorset, and that *Euphydryas aurinia* Rott. (Lep., Nymphalidae) and *Leptidea sinapis* L. (Lep., Pieridae) were reported to be in quite good numbers this year.

Mr. S. N. A. JACOBS added that an area of Hod Hill had been fenced off by arrangement with a local farmer.

The meeting concluded with a paper by Mr. R. W. J. Uffen, 'Subalpine Switzerland in July'.

27th JUNE 1968

The President, Mr. B. GOATER, in the Chair

EXHIBITS

Mr. C. O. HAMMOND—Interesting Diptera taken on the Sheep Leas field meeting, 9.vi.68; *Myopa buccata* (L.) (Conopidae), parasitic on bees and wasps; *Isopogon brevirostris* (Meig.), an asilid with a preference for chalk terrain; *Volucella inflata* (F.) (Syrphidae), an uncommon species of the genus; and *Microdon devius* (L.) (Syrphidae), a scavenger in ants' nests.

Mr. R. W. J. UFFEN—A worm (*Gordius* sp.) which is parasitic on beetles and other large insects, taken at Bix Bottom, Oxon., 22.vi.68.

COMMUNICATIONS

A talk was given by Mr. F. L. Reynolds, Surrey Naturalists' Trust, 'Nature Conservation in the South East'.

11th JULY 1968

The President, Mr. B. GOATER, in the Chair

EXHIBITS

The PRESIDENT—(1) Four examples of *Xylomyges conspicillaris* L. (Lep., Noctuidae), selected from a series found on fence posts in Herefordshire in early May 1968. One was the rare typical form, the other three ab. *melaleuca* View.
(2) *Apatele alni* L. ab. *steinerti* Casp. (Lep., Noctuidae) from Bushey, Herts.,

14.vi.68, with a typical example bred from Hants material for comparison. Two specimens, both ab. *steinerti*, came to mercury vapour light in the exhibitor's garden on the same night, the first time the species has been recorded in 14 years' collecting in the S. Herts. and N. Middx. area. A few other specimens have been taken in the area from time to time by other collectors, but all were apparently of the typical form.

Mr. E. P. WILTSHIRE—Exotic Lepidoptera as follows: (1) Sphingidae: *Celerio euphorbiae* L., one example from Lebanon Bekaa Plain, and another from Iran Elburz Mountains; *C. nicaea* de Prun., one example from Iraq, Shaqlawa (Kurdistan); *C. lineata* F. s.sp. *livornica* Esp., one example from Iraq, Basra; *Rethera komarovi* Christoph, one example from Iraq, Haj Omran (Kurdistan); *R. brandti* Bang-Haas, one example from Iran, near Tehran; and *Berutana kotschy* Koll., a vine-feeder, two examples from Iraq, Shaqlawa. (2) Zygaenidae: *Zygaena cuvieri* Boisd., one example from Iraq, which came to light at Haj Oman; *Z. cuvieri* s.sp. *libani* Burgeff, one example from Lebanon, Bsherre Cedars; *Z. haematina* Koll., one example from S.W. Iran, Barm-i-Firuz; *Z. saadii* Reiss, one example from S.W. Iran, Sineh Safid. (3) Noctuidae: *Amphipyra pyramidea* L. *forma typica*, one example from Iran, Tehran; *A. pyramidea* s.sp. *cuprior* Fletcher, one example from Lebanon. These localities for the exhibited forms are not mentioned in the recent revision of the families by Fletcher (1968, *Ent. Gaz.*, 19: 91–106).

Mr. A. E. GARDNER—Three species of rare and local Coleoptera from the New Forest, Hants: *Oxypoda spectabilis* Macck. (Staphylinidae), from a badger's sett, 6.vii.68; *Enicmus consimilis* Mann. (Lathridiidae), from a beech bole, 6.vii.68; and *Melandrya caraboides* L. (Melandryidae), from a beech stump, 8.vi.68.

Mr. D. O. CHANTER—Larvae of *Anepia irregularis* Hufn. (Lep., Noctuidae), taken at Icklingham, Suffolk, on *Silene otites* (L.) Wibel, 7.vii.68, and now feeding on carnation flowers.

Mr. C. F. DEWHURST—(1) *Locusta migratoria* (L.) (Salt., Acrididae), a gynandromorph example. (2) An example of a parasitic hymenopteron of the genus *Callajoppa* (Ichneumonidae) bred from a pupa of the Japanese sphingid moth *Psilogramma increta* Walk. (3) Nearly full-fed larvae of *Euproctis similis* Fuess. (Lep., Lymantriidae) taken from a hawthorn hedge in Dorset. (4) Young larvae of *Dasychira pudibunda* L. (Lep., Lymantriidae).

Mr. M. GIBSON—Lycaenid Lepidoptera including examples of *Maculinea arion* L. taken at Corvara in the Italian Dolomites at an altitude of approximately 5,000 ft; *Lycaena hippothoe* L., taken in the Taunus mountains, W. Germany, in June 1968; *Lysandra coridon* Poda from N. Italy and S.E. England; and *Lysandra bellargus* Rott., from S.E. England. Other species included *Strymon ilicis* Esp. (Spain), *Heodes tityrus* Poda s.sp. *subalpina* Syeyer (Italy), *Lycaena phlaeas* L. s.sp. *eleus* F. (Spain), *Quercusia quercus* L. (Spain), *Callophrys rubi* L. (Surrey), *Cyaniris semiargus* Rott. (Italy), *Aricia agestis* Schiff. (Surrey), *A. cramera* Esch. (Spain), *Cupido minimus* Fues. (Italy), *Philotes baton* Bgstr. (Italy), a series of *Polyommatus icarus* Rott. (Sussex), *Plebejus glandon* de Pr. (*orbitulus* Esp.) and *Lampides boeticus* L. (Spain) and *Celastrina argiolus* L. (Kent).

COMMUNICATIONS

The PRESIDENT announced that Mr. S. N. A. JACOBS had presented *The Dance Language and Orientation of Bees* by Karl von Frisch to the library.

Remarking that members would probably be obtaining further series of *Coenophila subrosea* Steph (Lep., Noctuidae) Mr. A. E. GARDNER said that he

would be glad to obtain specimens for the Society's collection as the species was as yet unrepresented.

Mr. G. PRIOR reported large numbers of moths collecting in a ladies' room at his hotel in the Tyrol. The room was not well lit and had a small window which was not left open very wide. On each occasion that Mr. Prior collected the insects there were not less than 20 species, *Plusia chrysitis* L. (Plusiidae) and *Eurrhynx hortulata* L. (Pyralidae) being the commonest.

Among the Lepidoptera reported, Mr. E. S. BRADFORD mentioned *Lygephila pastinum* Treits. (Plusiidae) at blue light; the President said that Dr. M. W. Harper had reported *Plusia ni* Hübn. (Plusiidae) and two *Eublemma parva* Hübn. (Noctuidae) from Ledbury, Heref. The President also reported several small pale *Plusia gamma* L. (Plusiidae), *Nomophila noctuella* Schiff. (Pyralidae), and one *Agrotis ipsilon* Hufn. (Noctuidae) from Bushey, Herts.

Mr. J. L. MESSENGER reported *Plusia ni* Hübn. (Plusiidae) from Romney Marsh, Kent, and Mr. A. E. Gardner, two *Stauropus fagi* L. (Notodontidae) from Banstead, Surrey. Mr. E. P. WILTSHIRE said he had spent an interesting evening, at Bix Bottom on 1st July when he saw many hawk moths and caddis flies coming to light. He also reported that when he was in Persia, sacking walls of latrines attracted moths, although they were not lit.

Mr. S. N. A. JACOBS spoke of many moths being attracted to dimly lit white walls in Spain and mentioned that *Phalera bucephala* L. (Notodontidae) congregated in one spot on the wall. Mr. Bradford said he had also seen caddis flies at a blue light. Mr. Gardner said that Trichoptera and Corixidae (Hem.) commonly moved at night.

On the subject of the effect of light, Mr. R. W. J. UFFEN said that he had found *Oegoconia deauratella* H.-S. feeding at the bottom of hedges in towns and had noticed that this very light-shy species does not mind tungsten street lighting but that its activity was curtailed by sodium light.

The President reported several *Ostrina nubilalis* Hübn. (Lep., Pyralidae) which may have come from N. Africa.

Insect Distribution Maps Scheme. The work of the Biological Records Centre at Monks Wood Experimental Centre, Abbots Ripton, Hunts., has been extended to include Orthoptera, Dermaptera and allied Orders. Details will be sent to anyone interested on application to Mr. J. Heath at the above address.—EDITOR.

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MEETINGS OF THE SOCIETY

are held regularly at the Society's Rooms, but the well-known ANNUAL EXHIBITION takes place this year on November 1st in the Conversazione Room at the British Museum (Natural History). Frequent Field Meetings are held at weekends in the Summer. Visitors are welcome at all meetings. The current Programme Card can be had on application to the Secretary.

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